

## **Bioethics Research: Contemporary Debates**

Autumn Semester 2011

### **Poor reproducibility and validity in animal experimentation: Implications for the use of animals in basic research**

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#### **Abstract**

Reproducibility is the cornerstone of scientific method. Results that cannot be reproduced are scientifically worthless and a nuisance if published in the literature, creating uncertainty and hindering scientific progress. Poor reproducibility and a lack of external validity occur throughout laboratory research from mass spectrometry proteomic profiling and microarray analysis to the social and behavioral sciences. In animal experimentation, where the lives of animals are highly valuable, this is also an ethical issue. Wasting animals for irreproducible research does not only raise ethical issues, but also questions present standards of animal experimentation in scientific terms and calls for research on how to improve reproducibility. Traditionally, animals, housing, and test procedures are standardized to maximize test sensitivity and minimize animal use, assuming that this will also guarantee reproducibility. However, by rendering animals within experiments more homogenous, standardization reduces within-experiment variation, while at the same time limiting inference to the specific experimental conditions. By contrast, systematic variation of experimental conditions renders animals within experiments more heterogeneous, which increases the external validity and hence the reproducibility of the results. Heterogenization may thus be a powerful tool to attenuate scientific and ethical costs in basic research, contributing to the refinement and the reduction of animal experimentation in the best of meanings of the three 'R' (reduction, refinement, replacement) concept.

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